Hundreds of Bewick's swans spend the winter at the Wildfowl and Wetlands Trust reserve on the flooded pastures of the Ouse Washes, Cambridgeshire, England.
Eckart Pott

Swans *Semper Fidelis*

Bewick's swans pair for life and are faithful year round

by Dafila Scott

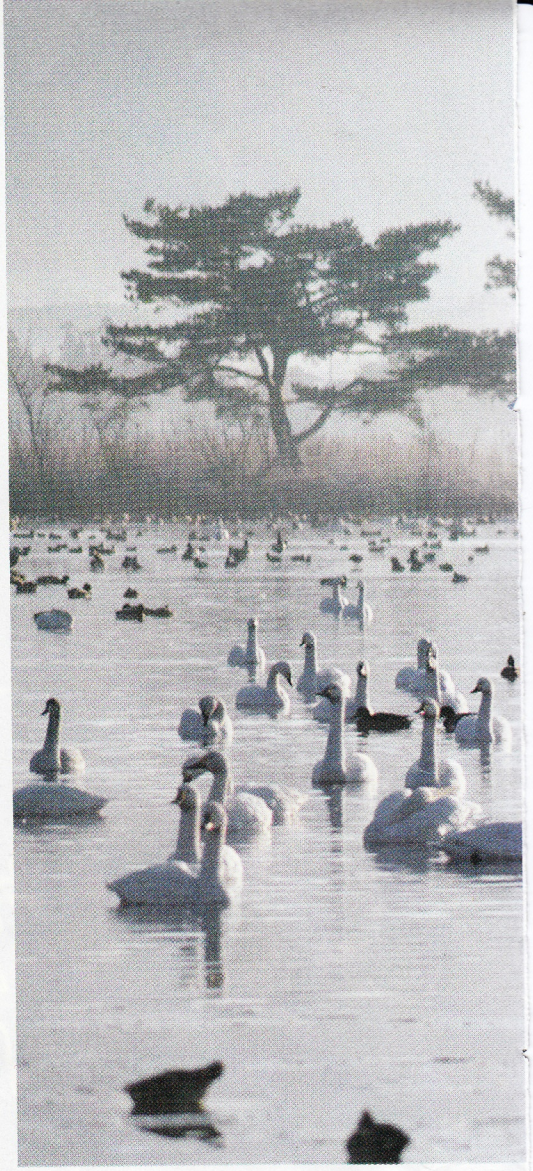
In the early 1950s, Bewick's swans, the smallest of the northern swans, first began visiting the estuary of the Severn River in the west of England. Occasionally, they flew into the newly established enclosures of the Wildfowl Trust in Slimbridge. This organization, now known as the Wildfowl and Wetlands Trust, was set up in 1948 by my father, Sir Peter Scott, and is devoted to the conservation of waterfowl. In the collection of captive birds at that time were some whistling swans. Now known as tundra swans, these birds are close North American kin of Bewick's swans; the two are races of the same species. The captive tundra swans attracted their wild confreres, and when the captive swans were moved to the pond in front of our house in February of 1964, the wild swans followed and also landed on the pond. Within a week, all twenty-four swans in the vicinity were flying in daily from the estuary half a mile away.

Within a few days, my father realized that individuals could be recognized by differences in the black-and-yellow patterns on their bills. These were like fingerprints, but much more obvious, and enabled us to give each bird a name (which we thought easier to remember than numbers). In mid-March the swans departed on migration, undertaking a 2,400-mile flight to their breeding grounds in the Russian Arctic. The following November, familiar individuals returned to Slimbridge bringing their young, or cygnets, of the year and also some of their "friends." (Some of the swans that breed in Russia winter in eastern Asia; others in western Europe, mainly in the Netherlands and the United Kingdom.) Sixty-eight swans were recorded at Slimbridge in the winter of 1964–65, and the following year the total was 147.

I became hooked on Bewick's swans early in 1966, when I was thirteen. Sent home from school because of an illness and forbidden to go out-of-doors, I spent much time staring out the window at the beautiful white birds floating on the pond. To my surprise, I found I could easily identify individual swans, and I soon learned to recognize the whole flock. More and more swans arrived at Slimbridge each year; one day in early 1971, we counted more than 400. Since then, annual numbers have leveled off at about 500. Over the years, our interest grew into a long-term study that involved not only me and my parents but also colleagues, such as Mary Evans and Eileen Rees, who have spent more than ten years studying the swans. By 1988, we had named more than 5,000 swans. Each bird has its own dossier with arrival and departure dates, identity of mate, portrait drawing, and photo where possible. We also record the number of cygnets associated with a pair each year as a measure of breeding success. By finding out the lifetime breeding success of individuals, we can discover which birds will leave more genes in the next generation.

Because remembering an ever increasing number of different faces proved difficult, and also because we wanted to document the swans' migratory movements, we have caught and marked more than

Ryukichi Kameda; Nature Production



An adult Bewick's swan, attended by three juveniles, threatens an opponent (out of picture), below. Adult males often engage in dominance battles, cheered on—through calling and body language—by their mates and offspring. While many of the Bewick's swans that nest in the Russian Arctic spend the winter in England and the Netherlands, others head east. In Japan, wintering Bewick's swans, right, share wetlands with ducks.

Philippa Scott

2,500 swans, using large plastic rings that can be read up to 200 yards away in good light. We have also devised a computer code for the bill patterns of unringed birds.

In 1972, we also began studying Bewick's swans at the Wildfowl Trust's reserve on the Ouse Washes at Welney in Cambridgeshire. There, in the heart of the flat fenlands, the birds roost on the flooded pasture of the Washes between two artificial rivers dug in the sixteenth century. Recently, the swans have "discovered" winter wheat; by day they graze on the wheat or eat waste potatoes in nearby fields, returning to roost in the evening.

Because individuals are so easy to distinguish and return each year to the same wintering place, we have been able to follow the lives of many swans. After decades of observation we are now able to answer some basic questions, such as how long Bewick's swans live, whether pairs stay together for life, how many cygnets they raise in a lifetime, and why some raise more healthy young than others.

Our studies at Slimbridge and Welney have shown that most individuals that survive their first winter go on to live to about twelve years of age, although some live much longer. Our oldest, Prongy, failed to return only after her twenty-sixth winter. Individuals do indeed pair for life. We have recorded no case of divorce among pairs that have raised young and only twenty cases among a thousand pairs that never bred successfully.

Bewick's swan partners not only remain faithful to each other over many years but also keep close company within winter flocks. At first I wondered why this intimacy was necessary. Then I discovered at Welney that there was considerable competition within flocks during feeding and that winners of disputes gained access to good feeding sites—a dense patch of waste potatoes, for example—at the expense of their opponents. Pairs almost always displaced single swans; the reverse was infrequent. By following members of pairs, I confirmed that when they were together they won a higher percentage of contests than when they were separated. This held true even for high-ranking pairs in the swans' social hierarchy. Both partners benefited from being together because they were able to feed without being bullied off the choicest sites; but since females didn't fare as well as males when separated from their partners, they gained slightly more from the association. I believe that is because the ability to win fights is related to body size, and males, at about thirteen pounds, are 13 percent larger than females.

While this may explain the importance of staying together over the short term, it does not explain why partners remain faithful for many years, even when they fail to raise young. By following the histories of known pairs, we have discovered that the longer they stay together, the more offspring they raise per year. During the first eight years after pairing, success in raising young gradually increased, the greatest improvement being between the swans' first and fifth years as a pair. This improvement was independent of the chronological age of the birds. Most birds had only one mate during their lives, but swans that lived to age thirteen had a better than 50 percent chance of having more than one mate. (As a swan aged, the chances of its mate dying increased.)

Even when they remated, these widows and widowers showed lower breeding rates, partly because 40 percent of them took more than one year to find another mate (and a few took up to six years). In addition, the new pairs seldom reared

cygnets in their first or second year together. Even birds at peak breeding age (six to ten years) usually took two years before breeding with a new mate, and older birds took slightly longer. Partners may simply need some time to learn to get on with each other. Overall, the more mates a swan had during its life, the fewer total young it raised. So fidelity is important, and loss of a spouse is not only sad but also costly in a reproductive sense.

In October and November, as the first wild swans descend from the autumn sky, we try to guess which pairs will bring cygnets. These are usually dominant pairs, and after they alight, much bugling and wing waving ensues as they dispute with other pairs to establish their positions in the winter hierarchy. Rankings established at this time usually remain stable for the rest of the winter and are the same wherever contestants happen to meet—either on the roosting site or out in the fields or flooded pastures where they feed. Dominance displays are spectacular and have often led people to believe that the swans are singing or dancing. Arguments between pairs begin with the birds stretching their necks low over the water and calling. Then they pump their heads up and down and may half open their wings. If this does not deter the opposition, the contest escalates. Both partners of each pair may spread their wings fully and flap them up and down, performing a bugling duet at the same time. If the opponents are equally matched, the males will resort to physical combat. They grab each other at the base of the neck and beat each other with their wings until one opponent gives up and flaps away. Sometimes the females join in by fighting with each other, but fights between males finally determine which pair dominates. More often, females are content to cheer on their mates with calling and head-pumping movements. Cygnets join in the cheering but never fight.

My first insight into the importance of the family unit in winter came as I watched the swans feeding on flooded meadows. I realized that the cygnets profited by their parents' ability to drive away competitors. Although the cygnets were three-quarters the size of adults by this time, when they moved away from the family group, they were often threatened by other swans and were sometimes unable to counter the threat and drive off the aggressor. But when they were close to their parents, cygnets were seldom threatened, and if they were, they could usually resist the opponent either alone or by calling their parents to them with high-pitched squeaks. When cygnets were separated from their parents by more than a few yards, they also spent less time feeding than when they were close to them. Orphaned cygnets spent little time feeding; when they found a good source of food, they were frequently displaced from it. In general, parents dominated pairs without young, providing effective protection for their cygnets. Offspring of dominant pairs did best. But even offspring of subordinates benefited by keeping close to them.

Paul Doherty

We do not yet know how much it matters to cygnets whether their parents are dominant or subordinate, but current evidence suggests that parental status may have a great impact on their lives. The offspring of dominant parents are themselves dominant as adults. We are waiting to see whether they also produce more offspring.

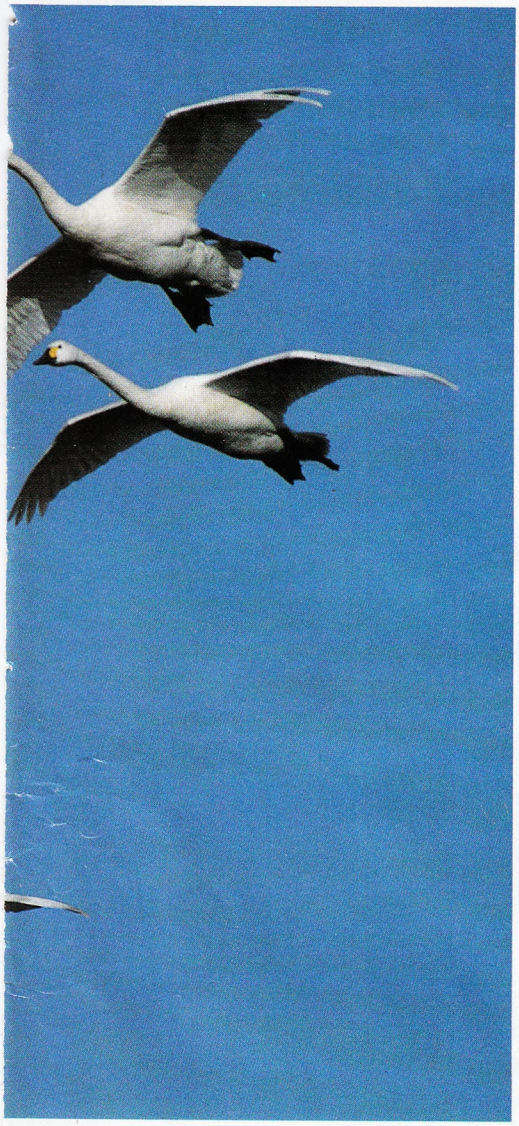
We have little information on the behavior of individuals on their arctic breeding grounds. Last year for the first time, my colleague Eileen Rees and I were able to visit the Russkiy Zavorot Peninsula, which lies north of the Pechora River Delta in the Nenetskiy National District of Russia, where Bewick's swans fitted with leg rings have been sighted in the past. Until recently, this area was a restricted zone even for Russian citizens. After many years of waiting and hoping, we were especially excited when permission for our trip came through.

Our aim was mainly to assess the population density, that is, the number of Bewick's swans on every square mile on the peninsula, now a protected area, and to compare this with previous estimates. But we were also keen to identify known individuals from Slimbridge and Welney. Imagine, then, our excitement when, on our second day on the tundra, after trudging across soggy ground against an eye-watering wind, Eileen thought she saw a white ring on the leg of one of a pair of swans nearby. I looked through my scope and confirmed that the bird was indeed ringed. At this point the problems began. The swans are very wild on the tundra, seldom allowing a viewer to approach within 300 yards. So in the end, we were unable to identify this swan either by bill pattern or by reading the leg ring. We saw two more of our ringed swans in the course of our stay and managed to identify one of these, which turned out to be a swan named Ieuan (the Welsh version of Ian), first identified in December 1990 in England. This male hid behind his mossy nest mound so as not to draw attention to its precious contents of four eggs—a typical clutch size. He finally got up and took off when I came within fifty yards. We have seen him again this winter in his traditional wintering site in Lancashire, but sadly he had no young in tow.

Studies of tundra swans in Alaska have shown that individuals tend to return to the same site to breed in successive years, as do Bewick's swans. The results of our surveys showed that the population density of Bewick's swans on the Russkiy Zavorot Peninsula has increased since 1980, a good sign. However, the area is surrounded by oil fields of potential economic importance, and we hope that the Russians will continue to safeguard this haven for swans and other waterfowl.

One thing about the tundra is certain: the timing of the spring thaw varies each year, and this crucially affects many species of birds, including Bewick's swans. If the snow melts early, the swans can build their nests and start laying early, and the water plants, which the family will need as food, can reach greater productivity earlier. Late thaws delay egg laying, and late-hatching cygnets have less chance of fledging before autumn arrives. In good years, when the thaw is early,

A family of Bewick's swans glide over the Welney wetlands, below, left. Bewick's are relatively small swans, with an average wingspan of seven feet. Even pairs of long standing engage in courtship displays on the wintering grounds, below. Copulation usually takes place during the spring migration or when the birds arrive on the tundra.
Philippa Scott; NHPA



many pairs return with young, and cygnets may make up as much as 25 percent of the winter population. In other years, the number of cygnets drops to only 7 percent. We look forward to collaborating further with our Russian colleagues to discover in more detail what factors affect the breeding success of swans on the tundra and whether swans born in good years or in poor years fare differently as time goes on.

Recently, I have been investigating individual differences in lifetime breeding success. Some pairs manage to raise healthy young in poor years, while others fail to do so even in good years. Although successful pairs usually return to England with two cygnets, they almost never return with more than five in one year, and the total varies greatly over the lifetime of different swans. Of those swans that survive to breeding age and pair, some fail to raise any young during their lifetime, while one pair we ringed, Pangle and Poppylot, produced forty-two young in eleven years. What made this pair and a few others that topped the thirty mark so successful? They all had one thing in common: the male was large.

Over the long term, dominant pairs and larger males and females raise more young. When all other factors were constant, the only significant predictor of such success was the size of the male, as measured by his skull length. I had previously thought that one male characteristic (perhaps size) and one female trait (perhaps body condition) might be equally vital to long-term success in raising young, and I was surprised to find that male characteristics appeared consistently more important.

We do not know if as yet unmeasured female characteristics will prove as important as male size in determining breeding success. If male characteristics are more important, then the females that re-pair should show a greater change in breeding rate than do males that re-pair. Although rate of breeding may increase or decrease dramatically in either sex after re-pairing, my data show a significantly greater change in breeding rate among females that take new mates on the death of their spouses. So, on present evidence, male characteristics appear to have the greatest bearing on the number of cygnets raised over the long term.

Why should male size be critical? I believe this relates to fighting ability. Only the outcome of fights between males determines relationships between pairs. In winter they fight for access to food, roosting sites, and dominance within the flock, while in summer they fight for breeding territories. My observations of territorial behavior among breeding Bewick's swans in Russia agreed with those that I had made on tundra swans in western Alaska in 1976. At both sites, the swans' breeding territories are large, up to half a square mile in area. Pairs unable to obtain territories must forgo breeding for that year and be content to join a nonbreeding flock. Competition is fierce; observers have reported tundra swans fighting to the death

An immature Bewick's swan will acquire adult white plumage and a characteristic black-and-yellow bill at about one year of age.
Ernest Duscher; Bruce Coleman, Inc.

to secure territories. My own observations in Alaska showed that territorial defense throughout the breeding season was undertaken mainly by the male, while the female was responsible for two-thirds of incubation duties and spent more time with newly hatched young. Our preliminary observations in Russia this summer confirmed this division of labor for Bewick's swans as well. The likelihood of large males winning more fights and maintaining a good breeding territory may explain why male size is so important to pairs.

Except for their disparity in size—known as size dimorphism—male and female Bewick's swans are outwardly identical. In many other monogamous birds, such as storks, the sexes are alike in both size and appearance. Unlike swans, however, storks share rather than split various nesting duties. Perhaps male swans must be large for territory acquisition and defense, while females must be smaller to conserve energy during the rigors of egg laying and incubation.

With this in mind, I examined the literature on the whole range of waterfowl species, most of which are monogamous either over the long term or serially. Three significant factors were associated with size dimorphism: territoriality, nesting, and pairing habits. As I predicted, territorial species were more dimorphic than nonterritorial ones. Hole-nesting species and those that took new mates annually showed greater size dimorphism than did open nesters and those with long-term pair bonds. These results suggest that the importance of territorial defense may indeed explain the size of male Bewick's swans.

To do justice to birds that live long and breed into old age, such as swans, we need long-term studies. To assure that Bewick's swans thrive in the future, we must turn our assumptions into facts and learn their natural history on both their wintering and breeding grounds, from England to the Arctic and back. Legendary for their fidelity, the swans have inspired in our researchers some of the same loyalty that the birds themselves display. □

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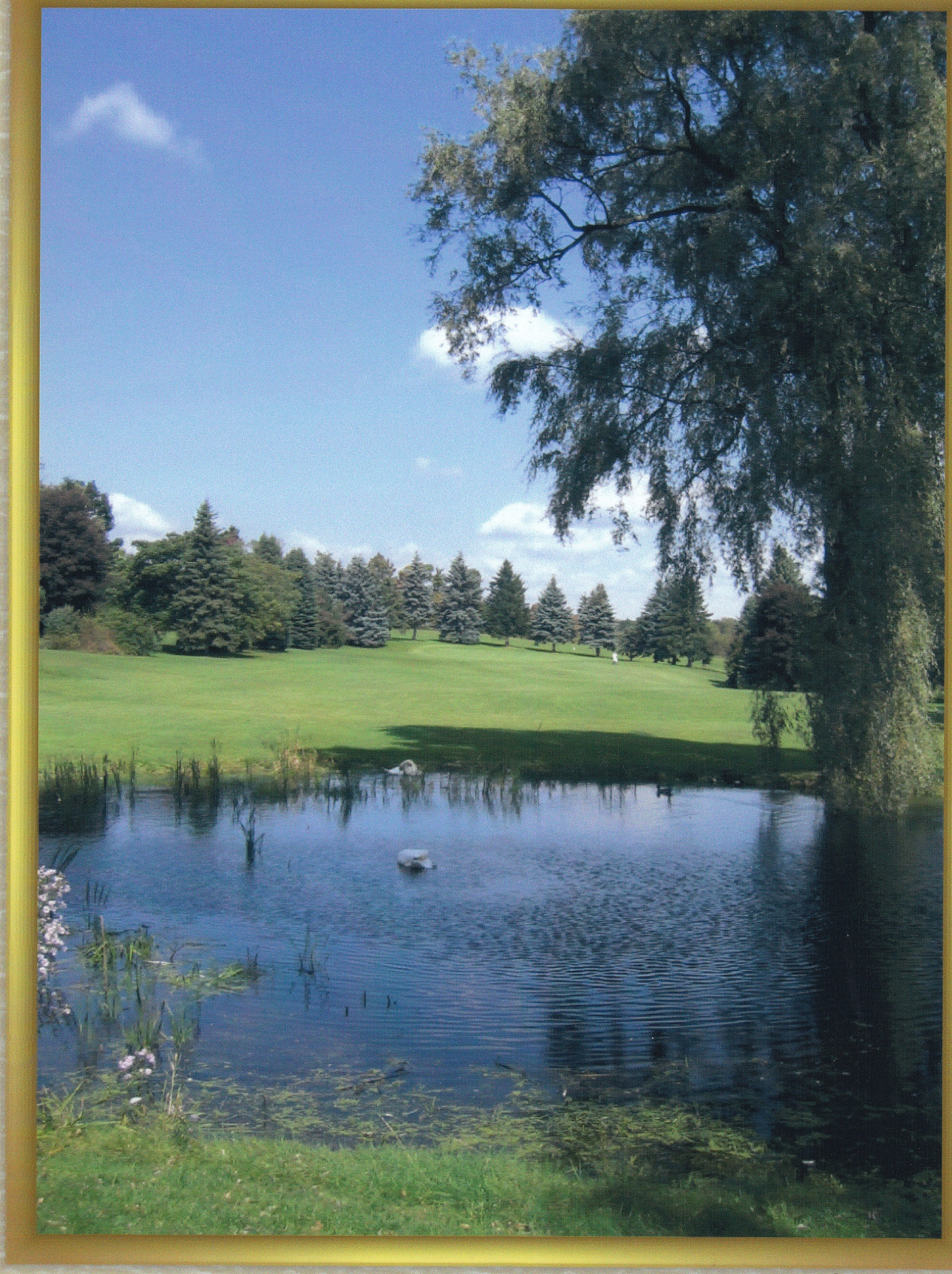

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Summer 2008

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